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SIZE OF STOCK IN RELATION TO ANIMAL INJURY

George S. Perry, Research Forester of the Forest Research Institute at Mont Alto, Pennsylvania, advances an interesting explanation of the apparent preference of deer and rabbits for large planting stock.

In a recent article 1/ he introduces evidences to show that deer and rabbits do more damage to larger sizes of stock. In 1932 and 1933 a number of coniferous plantings were established in open fields at an elevation of 2,100 feet above sea level. Red pine, white pine and several exotic species were used. In May, 1934, an examination was made to determine survival and the amount of damage done by deer and rabbits. The smaller stock, two years old, was established just about as well as the older, which was three years old when planted. However, the smaller stock showed far less damage as a result of grazing by deer. The theory is that large trees grown in fertilized nursery soil contain mineral salts in such large quantities as to make them especially attractive to deer and rabbits.

The Station has had similar experiences but attributed it to the fact that the small stock did not attract the notice of deer and rabbits as much as the larger plants. A striking instance of this is a seed spotting experiment begun at Moose Lake on the Superior National Forest in May, 1931. The seed spots germinated well and the seedlings were doing splendidly. The damage by rabbits was very slight up to the time the plants reached a height of about 3 inches. After this the proportion of nipped plants increased very noticeably.

Another very striking case with similar implications is a grading test carried out on the same National Forest. The stock planted was Norway pine, all of which was the same age, 2-0. The plants varied considerably in size, however, and they were graded on a size basis into three classes, large, medium, and small. The different sizes were planted in adjacent rows. The following table shows the proportion of the trees damaged by rabbits during the first summer and also during the second growing season.

Size Class	Per cent damaged	
	First season	Second season
Large	13%	38%
Medium	11	31
Small	9	23

1/ "Open Field Planting" - George S. Perry, Service Letter, December 6, 1934. The Pennsylvania Dept. of Forests & Waters.

The rabbits preference for large trees is plainly discernible. Whether this is due to higher salt content as suggested by Perry or to the greater conspicuousness of larger plants cannot definitely be determined from the data at hand. However, the Experiment Station's evidence points toward the latter factor as the attraction since the plants observed developed under essentially similar conditions and therefore the different sizes should not have varied greatly in salt content. That such variation did exist and that it may be correlated with size is perfectly possible however.

HOW TO REDUCE SPROUTING OF UNDESIRABLE SPECIES

The effectiveness of release cutting is often greatly reduced by the sprouting of the trees which have been cut. Usually the trees which must be eliminated to effect a release of the valuable species are hardwood trees or shrubs which sprout from the stumps or roots. If the cutting is carried on in the fall, winter, or early spring, the roots are well supplied with stored food materials and this condition is very favorable to vigorous sprouting. The sprouts growing from an already well developed root system make rapid growth, and soon another cutting is necessary if the valuable species are to be kept free from the competition of the worthless ones.

When cutting is done at the proper time, however, sprouting can be greatly reduced, if not practically eliminated. The ideal time is about mid-June, when the leaves have completely unfolded, but have not yet had sufficient time to restore the reserve foods used up in their production.

The effectiveness of this method is shown on four plots located near the Pike Bay Experimental Forest on the Chippewa National Forest. Five-year-old aspen suckers were cut in late June of 1931, and no suckers have come up since. Cutting of underbrush in the same manner has resulted in only weak and unimportant sprouting.

When aspen is to be eliminated in the release cutting, suckering can largely be prevented by girdling the trees in summer instead of felling them. Girdled trees will remain alive and the wood will stay in merchantable condition for one or two years after girdling. The girdled trees exhaust the roots. Moreover, it is not improbable that the roots die before the tops, and this, of course, would make the production of suckers impossible.

FUEL WOOD SALES AND IMMEDIATE CASH RETURN FROM CULTURAL WORK

In many cultural operations carried out by C.C.C. workers and under other emergency work projects, the trees which are cut are either left to rot in the woods where they add to the danger of insect and disease epidemics or must be burned at considerable cost in cash and criticism. Too little attention has been paid to the possibility of converting this material into useful products.

By expending a little additional labor, trunks and heavy limbs can be converted into cordwood and disposed of to local relief agencies or even sold at a price which yields a net return to the Government over and above the expenditure for the additional labor of working the felled trees up into cordwood. That such can be done is demonstrated by some cultural work done on the Pike Bay Experimental Forest at Cass Lake, Minnesota.

All the cutting was carried out as cultural work to release valuable reproduction from a decadent and unmerchantable overstory. The trees removed were mostly defective aspen which could scarcely be given away on the stump.

Through the cooperation of the Forest Ranger, it was possible to build up an excellent market for fuelwood in Cass Lake, Minnesota and vicinity.

In pole lengths along the roads it was fairly easy to dispose of the wood for 25¢ and 50¢ per cord. As stacked cordwood at $1.00 and $1.50 per cord it sold very readily. Not only did the local people buy over 450 cords at these prices but 150 cords were sold to Bemidji, 23 miles away, and local wood dealers asked for several times the amount available for shipment to North Dakota, 140 miles or more distant.

Undoubtedly there are many other places where advantage could be taken of emergency labor to produce a large quantity of fuel wood incidental to cultural work which would yield a return to the Government and yet at the same time make an actual contribution to local and national welfare, since the product is being used instead of destroyed.

ONE REASON FOR THE SPARSITY OF NORWAY PINE REPRODUCTION

The lack of Norway pine reproduction beneath seed trees on the Huron National Forest is one of the first things to impress foresters. Many possible reasons for the condition have been advanced; among them formation of sod under the trees, frequent hot, dry spells in the early summer, and infrequent good seed years.

However, there is one factor, usually overlooked, which has a considerable effect in cutting down the available seed supply and hence possible reproduction. This is the cone weevil. During the past three years many Norway pine seed trees have been carefully examined. Almost invariably the seed crops have been reduced from ten to forty per cent by weevils. During the present season, a thrifty tree examined in May indicated a crop, conservatively estimated at 800 cones. When the cones were collected in late September it was possible to obtain only 29 which had not been ruined by weevils. This is an extreme but not unusual example of conditions during the present year.

DUCKS AND THE DROUGHT

The Biological Survey has just published* its findings on the duck situation. During the winters of 1932-33 and 1933-34, observations on the comparative numbers of waterfowl were made by 1,164 qualified observers, including state game officials, sportsmen and ornithologists. The observers reported the number of ducks in 1933-34 in three classes, namely equal, less than, or more than in 1932-33. The majority of the reports from all sections of the country indicated that there were fewer ducks this year than last.

Maps are presented on which are indicated the main breeding grounds of the chief species of waterfowl and also the areas which have lately become unsuitable as breeding areas, chiefly because of drought conditions, either natural, or artificially induced by unwise swamp drainage projects.

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* "Status of waterfowl in 1934". United States Department of Agriculture, miscellaneous Publication No. 210.

INTERCEPTION OF RAINFALL BY FOREST CANOPY

In 1929 the Experiment Station published a technical note 1/, giving figures on the amount of rainfall intercepted by the forest cover. In general the study showed that about 80 per cent of the rain which fell in the open reached the ground in the forest. In the October 1934 issue of "Ecology" 2/ figures for interception of rainfall are given which compare very well with the results of the Experiment Station.

The study was carried on in Canada at the Petawawa Forest Experiment Station of the Dominion Forest Service. Comparison of the precipitation in the open with that under nearly full forest canopy was made. Five rain gauges were placed in various locations under a stand of mixed white pine and red pine with a crown density of 96 per cent. Five more gauges were set in a stand of mixed hardwoods, chiefly beech, birch, and maple. The density of the canopy here was 97 per cent.

The results indicated that about 80 per cent of the precipitation reached the forest floor under the hardwood stand and about 60 per cent under the softwoods. A striking difference between the results of this recent study and that made by the Lake States Forest Experiment Station is that in this study the per cent of rainfall reaching the ground under the hardwood stand was practically the same whether or not the leaves were on the trees. The results of the Experiment Station, however, showed that the interception of rainfall was about 9 per cent greater when the leaves were present. This latter seems the more logical result.

1/ "Interception of Rainfall by the Forest." Technical note No. 14 of the Lake States Forest Experiment Station.

2/ "The Penetration of Rainfall Through Hardwood and Softwood Forest Canopy." by H. W. Beall.

A SMALL FOREST NURSERY

Because of the great quantities of trees needed for large scale planting programs, forest nurseries are usually several acres in size. The larger nurseries are over 50 acres, and employ a skilled nurseryman and several workers. Such nurseries represent an economy in overhead and supposedly are also more economical in water development, in all labor costs, and in supervision. They have the big disadvantage of placing all the eggs in one basket.

On May 25, 1934, it was decided to develop a small nursery right out in the woods near the place where the plants would be used. An area 120 x 150 feet on the Chippewa National Forest was cleared of 47 year old aspen and 9 seed beds 4 x 50 feet sown one week later. The soil is a very fine sand with considerable silt and clay. The beds were weeded during the summer but not watered. On this area 110,000 seedlings were grown at an average cost including clearing, fencing, and weeding of $2.58 per thousand. All labor was done by C.C.C. men and costs are figured at $3.00 per six hour man-day.

Both the quality of the stock, especially in root development, and the price per thousand compare favorably with that of regular large sized nurseries. A water system has now been installed which will insure against loss by drought, but it is to be used only under extreme conditions, and in packing and transplanting stock.

The success attained in this small nursery would indicate the possibility of developing and utilizing such nurseries in any planting program. Such small nurseries might be very practical once a stable local personnel dependent upon forest work, has been developed, such as is the aim of subsistence homesteads on forest land.

INDIRECT RABBIT CONTROL

Efforts to protect young plantations from injury by rabbits have been directed toward the reduction in the number of rabbits. The success of these efforts has not been encouraging. However, effective protection can be attained by more indirect methods. Experiments conducted by the Station show that rabbit damage is greatly reduced by the removal of underbrush. For the past three years, rabbit damage has been kept at a low figure in white spruce plantations under aspen stands on the Chippewa National Forest. On two plots, each one acre in size, the underbrush was removed from 7/8ths of the area and left on 1/8th. Every year the rabbits nip from 40 to 60 per cent of the trees in the underbrush, but only 5 to 10 per cent of the trees in the cleared area. Some 60 acres of planting in brush areas were effectively protected from rabbit damage last winter by removing the brush.

Several examples can be drawn from experiments on the Superior National Forest also. In a white pine plantation set out in the spring of 1932, the damage by rabbits during the period October 1933 to September 1934, was as follows:

On 3 plots of 100 trees each - no overstory, sod ground-cover 6%
On 1 plot of 100 trees - jack pine overstory - light brush 15%
On 4 plots of 100 trees each - medium to heavy brush cover 55%

In another location a twenty acre clearing was planted with Norway pine and Scotch pine; the rabbit damage here was negligible except around the edges of the clearing which was bordered by heavy brush and aspen cover. The damage to a comparable plantation made in an area of patchy brush was 35 per cent.

The same results were noted on the Huron National Forest also. Observations upon four ten-acre plots showed rabbit damage only on the plot with brushy undergrowth and none on the three plots lacking such cover.

When the brush is removed it is believed that leaving scattered trees or snags as perches for hawks and owls will prove valuable in keeping down the number of rabbits.

HOW FAST DO FURROWS FILL IN?

That soil fills into planting furrows has long been a general observation, but just how much and how rapidly has been a matter of conjecture only.

During late August and early September four areas were plowed for experimental planting on the Huron National Forest. At the time of plowing, stakes were placed in the furrows so that they projected exactly four inches above the soil level. During the time of plowing and for nearly a month thereafter there were frequent and often heavy showers. As a result of these rains the soil became compacted and the furrows were deepened - on the average, about one eighth of an inch.

This condition, however, lasted only for a short time and by the middle of October measurements indicated the following amounts of fill-in above the original furrow level:

Character of Soil	Average Fill-in (Inches)
Sandy lake-bed deposits	3/16
Glacial river delta - gravelly sand	2/16
Morainic deposits - predominantly sandy	6/16
Sandy outwash plain	3/16

At individual locations the amount of fill-in varied all the way from minus one eighth inch to one and one-sixteenth inches.

BOARD FOOT CONTENT OF LUMBER

The New York State College of Forestry at Syracuse University has just recently published a very handy alinement chart for determining the board foot content of lumber. It is printed on a stiff piece of cardboard of small notebook size. With the aid of this chart the contents in board feet of any one or two inch board from 2 to 12 inches wide and from 6 to 16 feet in length can be obtained simply and quickly.. The total content of a number of pieces of the same size can also be determined from it. The Experiment Station has requested a few copies for the field men. Additional copies can be requested from the New York State College of Forestry, Syracuse, New York.

Get Copies

FURROWING AND GRADING IMPROVE SURVIVAL IN PLANTING

Success in planting cannot be obtained by the use of "short cut" or "cure-all" formulas, but rather by proper attention to many details, no one of which is very important alone, but which in the aggregate determine success or failure. As an example of this, an experiment started on the Superior National Forest in May, 1933, may be used. In this experiment, 3,000 2-year-old Norway pine seedlings were planted, half in furrows and half in 18-inch square scalped spots.

The plowing job was by no means a good one since it was done with a team of horses and a plow not well adapted to the work. Much better work would have been done by a tractor-drawn plow of the double mold-board type had such equipment been available. Nevertheless, at the end of the second growing season, the trees planted in the furrows had an average survival of 82 per cent as compared to 73 per cent for the trees planted in scalped spots.

In the same study, the trees were graded into three sizes - large, medium, and small - before being planted. The survival of the large is 79 per cent, the medium 81 per cent, whereas only 73 per cent of the small trees are still alive. If the planting stock is divided equally among the three size classes, the average survival will be increased 3 per cent by culling the small class.

In this case, neither plowing nor using the larger trees changed the survival greatly, but the total effect of the two factors is considerable.

CENSUS OF AGRICULTURE

During January the Bureau of the Census began a farm census which will be of unusual importance as the data collected in this census will form the basis for Federal, State and local agricultural adjustment programs of all types.

The Director of the Census Bureau, William L. Austin, has made special efforts to publicize the census so that farmers and ranchers might secure sample schedules of the questions, thus making it possible for farmers to have accurate answers already prepared when the census enumerators call on them.

It is probable that much of the data secured by this census will be useful in drawing up land utilization plans involving forestry as well as farming.